eOftalmo
http://eoftalmo.org.br

UPDATE

Age-related distance esotropia

Esotropia para longe relacionada à idade

Esotropía de lejos relacionada a la edad

Gustavo Henrique de Lima Melillo - Hospital Universitário da Universidade Federal de Juiz de Fora - (HU UFJF) - Juiz de Fora, MG.
Marta Halfeld Ferrari Alves Lacordia - Hospital Universitário da Universidade Federal de Juiz de Fora - (HU UFJF) - Juiz de Fora, MG.

ABSTRACT

The incidence of esodeviation at distance has been increasing in adult and elderly patients. Several etiopathological mechanisms have been suggested for its development, but a consensus has not yet been reached. Recent studies implicated involutional changes in the orbital connective tissues in the imbalance of extrinsic muscle actions. Initially, patients with this type of strabismus complain of blurred vision on distance fixation that progresses to diplopia at distance. The esodeviation increases gradually, and thus, diplopia becomes clinically significant. Cases may be managed by prescribing temporal prisms or with surgery. This paper presents a review of the literature on the topic and provides a summary of the current situation.

Keywords: Esotropia; Ocular Motility Disorders; Diplopia.

RESUMO

É cada vez maior a incidência de esodesvios para longe em pacientes adultos e idosos. Diferentes mecanismos etiopatogênicos já foram sugeridos para o seu desenvolvimento, sem contudo haver sido estabelecido consenso. Estudos recentes implicaram alterações involucionais dos tecidos conectivos da órbita no desequilíbrio entre ações da musculatura ocular extrínseca. Inicialmente, os portadores deste estrabismo acusam borramento visual para foco à distância, que progride para diplopia para longe. O esodesvio aumenta progressivamente e, com isso, a diplopia torna-se clinicamente significativa. Os casos podem ser conduzidos com a prescrição de prismas de base temporal ou cirurgia. Este artigo tem a proposta de revisar a literatura sobre o tema, sumarizando suas atualidades.

Palavras-chave: Esotropia; Transtornos da Motilidade Ocular; Diplopia.

RESUMEN

Es cada vez mayor la incidencia de desvíos dirigidos hacia fuera en pacientes adultos y de edad. Diferentes mecanismos etiopatogénicos se sugirieron anteriormente para su desarrollo, sin haberse establecido un consenso. Estudios recientes implicaron alteraciones involucionales de los tejidos conectivos de la órbita en el desequilibrio entre acciones de la musculatura ocular extrínseca. Inicialmente, los portadores de este estrabismo acusan visión borrosa para enfocar distancia, que progresa a diplopía de lejos. El desvío hacia fuera aumenta progresivamente y, con eso, a diplopía se vuelve clínicamente significativa. Los casos pueden ser conducidos con la prescripción de prismas de base temporal o cirugía. Este artículo propone revisar la literatura sobre el tema, haciendo un resumen de sus actualizaciones.

Palabras Clave: Esotropía; Trastornos de la Motilidad Ocular; Diplopía.

Received: December 18, 2018
Accepted: April 03, 2019
Funding: No specific financial support was available for this study.
Disclosure of potential conflicts of interest: None of the authors have any potential conflict of interest to disclose.
Corresponding Author: Gustavo Henrique de Lima Melillo. Rua Avenida Eugênio do Nascimento, s/nº, HU- UFJF Dom Bosco - Juiz de Fora, MG - CEP: 36.038-330 - Brasil email: gustavo_melillo@hotmail.com.

How to cite: Melillo G, Lacordia M. Age-related distance esotropia. eOftalmo. 2019:5(2):81-85.
http://dx.doi.org/10.17545/eoftalmo/2019.0014

INTRODUCTION

Esotropia (ET) only at distance in adult patients has been recognized by the ophthalmological community since the 19th century[1,2]. Several mechanisms of physiopathogenesis have been postulated and different classifications and designations have been proposed[1–5].

In 1883, Parinaud observed patients with complete divergence inability and associated the condition with neurological diseases, later coining the term "divergence paralysis" for the syndromic diagnosis[1]. In the following decade, Duane observed a case of esotropia greater at distance than at near with a divergence amplitude lower than five prism diopters ($^{\Delta}$)[2] and proposed the term "divergence insufficiency" for the condition. Today, the most appropriate term for this condition is age-related distance esotropia (ARDE)[6,7] because imaging studies of the orbit show that involutional changes in the extrinsic muscles (EOM) and connective tissues could be the cause of deviation[8–10] and the divergence amplitude is not always reduced[6].

Acquired esotropia is categorized as follows: (1) Swan type, which occurs following temporary occlusion of one eye[11]; (2) Franceschetti type, which occurs without any obvious cause[12]; and (3) Bielschowsky type, which is associated with myopia[13]. ARDE has features of both Franceschetti and Bielchowsky types while being markedly different. Similar to Franceschetti-type esotropia, ARDE occurs without any apparent cause; however, ARDE is almost always only at distance. Patients affected by Bielschowsky-type esotropia are usually younger than those affected by ARDE and have pre-existing primary esophoria, increased tonus of the medial rectus muscles, and failure of the fusional mechanism with permanent diplopia[6].

A gradual increase in the incidence of ARDE has been observed over the last 10 years. A retrospective study showed that ARDE accounted for 10.6% of cases of strabismus that develop in the adult years[14]. It is estimated that, because of population aging, this type of strabismus will become increasingly prevalent[14].

CLINICAL MANIFESTATIONS

Distance diplopia is usually the first clinical manifestation, which may be intermittent or permanent[15–17]. Complaints of double vision perception while driving or looking at a screen at a distance are not uncommon[15]. In early stages, when esodeviation is still < 4^{Δ}, the complaints may be limited to blurred vision or perception of double contour in objects at far[16]. The strabological test shows esotropia at distance and exophoria, esophoria, or more frequently, orthophoria at near. The average deviation at diagnosis is 6^{Δ} at distance[17]. Vertical deviations are rarely observed[6]. Esotropia at distance tends to increase gradually and diplopia, in addition to becoming more significant, is increasingly perceived at near[17]. Divergence amplitude is reduced when compared with presbyopic individuals without strabismus, although it may be normal[6,17]. There is no associated neurological disease or lateral rectus muscle action limitation[15]. Distribution of ametropia among these patients does not follow a specific pattern. Patients in the seventh and eighth decades of life are at higher risk for its onset[6,17]. A cohort study showed a mean age of 74.3 years[17], whereas in a retrospective analysis it reached 77.5 years[6].

ETIOLOGY

The physiopathogenesis of ARDE has been the object of discussion and studies of varied nature. Divergence insufficiency may be secondary to neurological diseases such as cancer and infections of the central nervous system, trauma, intracranial hypertension, demyelinating diseases, neurotoxicity, and neurovascular diseases[16]. However, explaining the origin of divergence insufficiency in the absence of neurological dysfunction is a challenge. Guyton proposed the occurrence of shortening of the medial rectus muscles and elongation of the lateral rectus muscles caused by an increased convergence tonus in presbyopic individuals, especially in undercorrected hyperopia, wherein the accommodation effort is greater[18]. Chaudhuri and Demer analyzed magnetic resonance images of the orbits of elderly patients with esotropia greater at distance and cyclovertical deviation and suggested that the process of connective and muscle tissue aging leads to changes in the position of the horizontal rectus muscles and creates an imbalance between their actions. He called the set of changes caused by this process "sagging-eye syndrome."[8–10]

DIFFERENTIAL DIAGNOSIS

Esotropia greater at distance of progressive onset may be associated with other conditions. In patients with high myopia, the esodeviation may be caused by the displacement of the extraocular muscles secondary

to the elongation of the eyeball. However, unlike ARDE, distance esotropia in patients with high myopia may be accompanied by muscle hypofunction[19].

Spasm of accommodation may also be responsible for esodeviation at distance. In this condition, caused by intense visual effort at near, asthenopia and myopia may be confused with the initial complaints of patients with ARDE. The patient's age allows distinguishing between the two conditions because spasm of accommodation occurs more frequently in younger adults, particularly between the third and fifth decades of life[20].

Treatment

Godts *et al.* followed a cohort of patients with ARDE for at least 5 years to analyze the long-term behavior of the disease[17]. The authors confirmed a statistically significant increase in distance esotropia over the study period. Unlike in previous studies, the reduction in the convergence amplitude was not significant. As the deviation increases and the fusional amplitude remains the same, patients begin to notice binocular diplopia at increasingly shorter distances. Clinical management with the prescription of temporal prisms is an option preferred by ophthalmologists for deviations of up to 12^{Δ}, although cases with greater deviations, of up to 18^{Δ}, have been successfully treated[16]. The weight of the prism lenses, chromatic aberration, and the unaesthetic appearance are factors that hinder adaptation to prisms. Fresnel prisms may be prescribed for patients with greater deviations for which surgery is not an option. Orthoptic exercises have not been shown to be beneficial in the treatment of divergence insufficiency[16].

Surgery provides good results in ocular realignment and diplopia resolution in patients with large esodeviation or intolerant to prisms. Initially, resection of the lateral rectus muscle was established as the procedure of choice of strabologists because of fear that recession of the medial rectus muscle could lead to convergence insufficiency and overcorrection at near[21]. Stager *et al.* treated 57 patients with unilateral resection of the lateral rectus of the non-dominant eye and obtained 86% of patients who did not require additional procedures or prisms, 10.5% of patients who needed prisms to eliminate residual diplopia, and 3.5% of patients who required a second operation[22]. Thacker *et al.* performed 24 bilateral and five unilateral resections of the lateral rectus. The results were satisfactory for all patients, but there was a recurrence rate of 6.8% during the follow-up period (mean of 38.7 months)[21].

Recession of the medial rectus muscle was also a successful option in several series of cases of surgical correction of esotropia greater at distance reported in the literature. Bothun and Archer described eight patients who underwent bilateral recession of the medial rectus, of which three required reoperation[23]. Convergence insufficiency was not observed in the post-operative follow-up period, but a mean exophoria at near of 1.8^{Δ} (range from 8^{Δ} exophoria to 10^{Δ} esotropia) was reported. In addition, Archer reviewed 267 cases of patients submitted to recession of the medial rectus muscles to treat esotropia with distance-near incomitance and the result was 9% of exodeviation at near[24].

Chaudhuri and Demer reviewed the post-operative results of 93 patients who underwent different surgical procedures to correct sagging-eye syndrome[25]. The authors found 14% of recurrence in the group submitted to recession of the medial rectus and 25% of recurrence among those who underwent resection of the lateral rectus. The study also investigated recurrence in groups of patients submitted to other procedures, such as imbrication of the lateral rectus to the superior rectus with superior transposition of the lateral rectus (67%), partial tenotomy of the vertical rectus muscles (17%), and recession of the vertical muscles (22%), because the patients had associated cyclovertical deviations. The authors concluded that recurrence should be interpreted taking into account the progress of the dehiscence of the orbital connective tissues.

The surgical dose for the correction is also a topic of discussion. Some authors state that recessions of the medial rectus muscles need to be more extensive than what is recommended in the Parks table for esodeviations[26–28]. However, successful treatment with the standard planning of recession has also been reported[23].

CONCLUSION

ARDE is a condition increasingly diagnosed by ophthalmologists. Although some studies indicate that involutional changes in the orbital connective tissues are the cause of esodeviation, the physiopathogenesis of the disease is still unclear. At the time of diagnosis, the exclusion of neuropathy is fundamental. The prescription of temporal prisms may produce satisfactory results for small and moderate deviations. Surgery resolves the condition in the majority of cases, with studies showing good results after resection of the lateral rectus and recession of the medial rectus.

REFERENCES

1. Parinaud H. Clinique nerveuse: Paralysis des mouvements associes des yeux. Arch Neurol (Paris). 1883;5:145-72.
2. Duane A. A new classification of the motor anomalies of the eyes based upon physiological principles, together with their symptoms, diagnosis and treatment. New York: Annals of Ophthalmology Otology; 1896 oct. p.969-1008.
3. Lyle DJ. Divergence insufficiency. AMA Arch Ophthalmol. 1954 dec;52(6):858-64.
4. Bruce GM. Ocular divergence: its physiology and pathology. Arch Ophthalmol. 1935 apr;13(4):639-60.
5. Scheiman M, Gallaway M, Ciner E. Divergence insufficiency: characteristics, diagnosis, and treatment. Optom Vis Sci. 1986 jun;63(6):425-31.
6. Oatts JT, Salchow DJ. Age-related distance esotropia – fusional amplitudes and clinical course. Strabismus. 2014 jun;22(2):52-7.
7. Mittelman D. Age-Related Distance Esotropia. J AAPOS. 2006 jun;10(3):212-3.
8. Clark RA, Demer JL. Effect of aging on human rectus extraocular muscle paths demonstrated by magnetic resonance imaging. Am J Ophthalmol. 2002 dec;134(6):872-8.
9. Chaudhuri Z, Demer JL. Sagging eye syndrome: connective tissue involution as a cause of horizontal and vertical strabismus in older patients. JAMA Ophthalmol. 2013 may;131(5):619-25.
10. Demer JL. Connective tissues reflect different mechanisms of strabismus over the life span. J AAPOS. 2014 aug;18(4):309-15.
11. Swan KC. Esotropia following occlusion. Arch Ophthal. 1947 apr;37(4):444-51.
12. Burian HM, Miller JE. Comitant convergent strabismus with acute onset. Am J Ophthalmol. 1958 apr;45(4 Pt 2):55-64.
13. Bielchowsky A. Das Einwärtsschielen der Myopen. Ber Dtsch Ophthalmol Ges. 1922;43:245-248.
14. Martinez-Thompson JM, Diehl NN, Holmes JM, Mohney BG. Incidence, types, and lifetime risk of adult-onset strabismus. Ophthalmology. 2014 apr;121(4):877-82.
15. Thomas AH. Divergence insufficiency. J AAPOS. 2000 dec;4(6):359-61.
16. Kirkeby L. Update on divergence insufficiency. Int Ophthalmol Clin. 2014 summer;54(3):21-31.
17. Godts D, Deboutte I, Mathysen DGP. Long-term evolution of age-related distance esotropia. J AAPOS. 2018 apr;22(2):97-101.
18. Wright WW, Gotzler KC, Guyton DL. Esotropia associated with early presbyopia caused by inappropriate muscle length adaptation. J AAPOS. 2005 dec;9(6):563-6.
19. Kohmoto H. Divergence insufficiency associated with high myopia. Clin Ophthalmol. 2010 dec;11-16.
20. Sarkies NJ, Sanders MD. Convergence spasm. Trans Ophthalmol Soc U K. 1985;104(Pt 7):782-6.
21. Thacker NM, Velez FG, Bhola R, Britt MT, Rosenbaum AL. Lateral rectus resections in divergence palsy: results of long-term follow-up. J AAPOS. 2005 feb;9(1):7-11.
22. Stager DR, Black T, Felius J. Unilateral lateral rectus resection for horizontal diplopia in adults with divergence insufficiency. Graefes Arch Clin Exp Ophthalmol. 2013 jun;251(6):1641-4.
23. Bothun ED, Archer SM. Bilateral medial rectus muscle recession for divergence insufficiency pattern esotropia. J AAPOS. 2005 feb;9(1):3-6.
24. Archer SM. The effect of medial versus lateral rectus muscle surgery on distance-near incomitance. J AAPOS. 2009 feb;13(1):20-6.
25. Chaudhuri Z, Demer JL. Long-term Surgical Outcomes in the Sagging Eye Syndrome. Strabismus. 2018 mar;26(1):6-10.
26. Mittelman D. Surgical management of adult onset age-related distance esotropia. J Ped Ophthalmol Strabismus. 2011 jul/aug;48(4):214-6.
27. Chaudhuri Z, Demer JL. Medial rectus recession is as effective as lateral rectus resection in divergence paralysis esotropia. Arch Ophthalmol. 2012 oct;130(10):1280-4.
28. Repka MX, Downing E. Characteristics and surgical results in patients with age-related divergence insufficiency esotropia. J AAPOS. 2014 aug;18(4):370-3.



Gustavo Henrique de Lima Melillo

Lattes: http://lattes.cnpq.br/5652746370496594
ORCID: https://orcid.org/0000-0002-3280-4738



Marta Halfeld Ferrari Alves Lacordia

Lattes: http://lattes.cnpq.br/4777310256357609
ORCID: https://orcid.org/0000-0003-4296-4871